COPY OF PAPERS ORIGINALLY FILED

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:
Jiang et.al	:
Serial No. 09/682,630	: Group Art Unit: 1742
Filed: 10/01/2001	: Examiner: A Wessman
For Rhodium, Platinum, Palladium Alloy	:

DECLARATION OF MELVIN R. JACKSON
UNDER 37 CFR 1.132

Honorable Commissioner of Patents and Trademarks,

Washington, DC 20231

S I R:

I, Melvin R. Jackson, declare:

I received the degree of Bachelor of Science in Metallurgical Engineering from Lehigh University in 1965, the degree of Master of Science in Metallurgy and Materials Science from Lehigh University in 1967, and the degree of Doctor of Philosophy in Metallurgy and Materials Engineering from Lehigh University in 1971. Following the receipt of my doctoral degree, I spent a year with the International Nickel Company at the Paul D. Merica Research Laboratory.

In 1972 I joined the research staff of General Electric Corporate Research and Development. My research efforts since joining General Electric have been in large part in the development of advanced high-temperature alloys. The development of alloys based on platinum-group metals has been one of my principal projects.

I am a joint inventor of the subject matter of the patent application noted above. The invention claimed in said application is a high temperature alloy comprising platinum-group metals, and articles made with said alloy. The

subject patent application includes several claims directed to alloys comprising specific composition ranges of platinum, palladium, and rhodium. These specific ranges for the elements define an alloy composition region on the ternary Pt-Pd-Rh phase diagram as shown in Figures 1-3 of the subject patent application.

The selection of alloys having the specific composition ranges recited in claims 35-58 of our application was the result of a comprehensive experimental program designed to discover alloys with desirable combinations of several characteristics that we deemed necessary for use in advanced gas turbine applications. These characteristics include oxidation resistance, melting point, tensile and creep rupture strength, elastic modulus (E), coefficient of thermal expansion (α), the product of E and α (as described in the subject application), cost, degree of interaction with superalloy substrates during high temperature exposure, and density. In performing such a complex, multivariate optimization, we discovered several competing trends as a function of alloy composition, as depicted in Figure A. For example, desirability for cost and $E\alpha$-factor lies in the direction of the Pd-rich corner of the phase diagram, while desirability for oxidation resistance lies in the opposite direction, toward regions of minimal Pd content. Similar competitive relationships exist for other groups of material characteristics, as shown in Figure A. The particular alloy compositions we claim in the subject application represent the results of our multivariate optimization among these many competing variables.

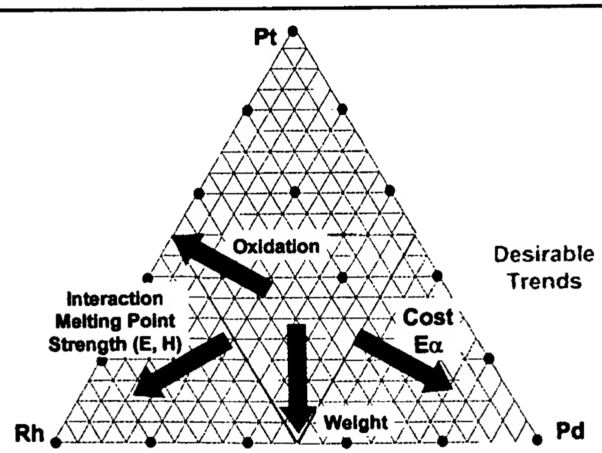
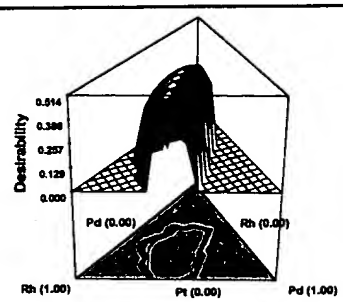


Figure A

Several alloy compositions evenly distributed throughout the Pt-Pd-Rh composition space were evaluated for a number of the properties listed above, while at the same time, specification limits and relative weightings were determined for each of these properties based on expected needs of current and

future gas turbine engines. Several multi-dimensional, weighted optimization routines were then performed using the data and specification limits as inputs to the commercial software package known as "Stat-Ease." By considering the trends and interactions in the data, along with the values and assigned weightings of the specification limits, the software calculated a composite figure of merit called "desirability", determined which composition ranges had the



Constraints

Name	Goal	Lower Limit	Upper Limit	Lower Weight	Upper Weight	Importance
Rh	0.00..1.00	0	1	1	1	2
Pd	0.00..1.00	0	1	1	1	2
Pt	0.00..1.00	0	1	1	1	2
E	15..35	15	35	1	1	1
alpha	>= 9	7	9	1	1	2
Ealpha	<= 92.8141	92.8141	291.1	1	1	2
oxid rate	<= 1	1	1.6	1	1	4
density	12.008..17	12.008	17	1	1	2
Interaction	<= 2.03647	2.03647	12	1	1	3
Cost	<= 35	35	60	1	1	2

Solutions

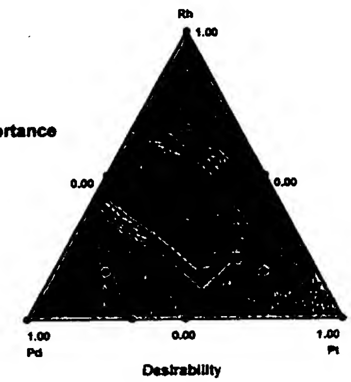
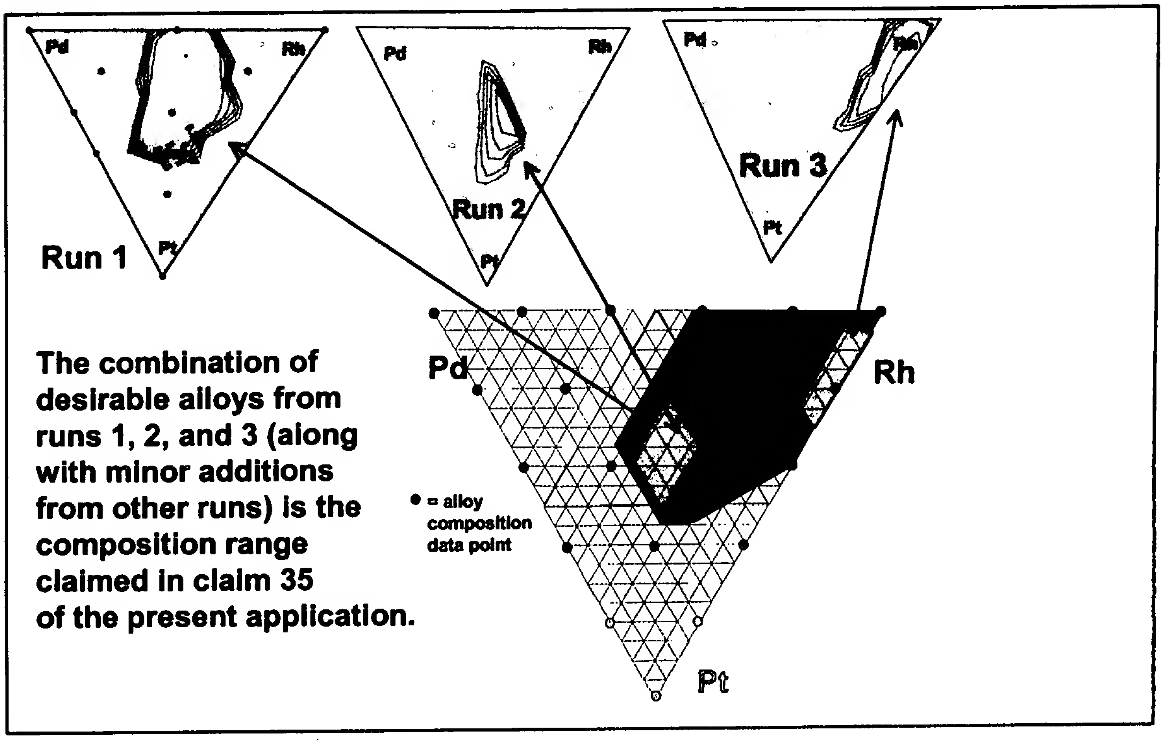


Figure B

highest desirability, and graphically represented the desirable ranges. An example of one particular optimization and its results is given in Figure B. Note that desirability is quite low outside the boundaries of the contour plot. The compositions inside the boundaries represent those alloys determined to be suitable based on the particular requirements we specified.

Although all of the properties discussed above are important for high temperature alloys, those properties that we considered to be most important for a high temperature alloy depended in large part on the nature of the desired application. For example, high oxidation resistance is highly important for alloys designed for use as turbine blade tips, while low interaction with superalloy substrates is very important for alloys designed for use as coatings. Therefore, multiple optimizations, employing various parameter weighting strategies, were performed to encompass a variety of application

options. Figure C illustrates how the combination of a number of complementary optimization studies determined the composition range recited in claim 35 of the present application. Run 1 included what we considered to be the broadest ranges of suitable values for the chosen parameters, and included cost in the



optimization. Run 2 was performed with particular emphasis on the Eα factor, seeking to closely match the Eα factor of the alloy with that of Ni-based superalloys to minimize thermal stresses in an assembled part comprising both materials. Run 3 was performed with emphasis primarily on oxidation resistance and high-temperature strength.

The combination of the desirable alloys from runs 1, 2, and 3, along with minor additions from other runs not shown, represents the claimed composition range of claim 35 in the subject patent application. Pt-Pd-Rh alloys with compositions outside this calculated range do not have the particularly desired combination of properties deemed suitable for the uses for which our study was designed. The specific alloys of run 2 are depicted in Figure 3 (region 35) of the subject application and are particularly recited in claim 41. Similarly, the specific alloys of run 3 are depicted in Figure 3, region 40, in the subject patent application, and are particularly recited in claim 42.

The above discussion points out that the alloys claimed in the subject patent application have a particular composition range that we discovered to have uniquely useful combinations of properties for use in high temperature applications, such as, for example, gas turbine engines. We performed a series of weighted, multivariate optimization studies to balance multiple sets of competing trends in our experimental data, and found that the claimed range contained the alloys that met our particular standards for performance.

I finally declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

June 21, 2002
Date

Signature